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Organic Matter Important in Field Analysis of Soil Texture

Practicing foresters occasionally conduct textural analysis of soils in the field by quick-test methods. While satisfactory results are obtained under many soil conditions by these methods, the forester should continually be alert to variables that influence the accuracy of the determination.

The effect of organic matter in preventing complete dispersion of the soil sample has been well documented by several investigators.[1] Tyner[2] concluded that no method of soils textural analysis is equally suited to all types of soils.

The problem is illustrated by soil samples taken from three fixed depths (0-6 inches, 6-36 inches, 36-72 inches) on 84 plots in established field shelterbelts in the eastern half of North Dakota. Textural analysis of the 252 soil samples was made by the hydrometer (Cenco-Wilde) method.[3] Subsequently textures by the pipette method of Kilmer and Alexander[4] and soil organic matter percent by the method of Walkley and Black[5] were determined on these samples in the soils laboratory at North Dakota State University.

In almost every case the hydrometer method gave lower values for silt-plus-clay content of the samples than did the laboratory analysis employing the pipette method. At the lowest level of organic matter content (0.54 percent) there is a negative difference of 1.8 percent (fig. 1). Progressively greater differences were obtained as the percentage of organic matter in the sample increased (the pipette method showing the higher silt-plus-clay percentage) until a maximum positive difference of 67.6 percent silt-plus-clay was reached where organic matter content was 7.66 percent. Differences in silt-plus-clay

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[1] *Beale, O. W. Dispersion of laterite soils and the effect of organic matter on mechanical analysis. Soil Sci. 43: 475-479. 1939.*

Robinson, G. W. Note on the mechanical analysis of humic soils Jour. Agr. Sci. 12: 287-291. 1922.

Joseph, A. F., and Snow, O. W. The dispersion and mechanical analysis of white heavy alkaline soils. Jour. Agr. Sci. 29: 106-120. 1929.

[2] *Tyner, E. H. The use of sodium metaphosphate for dispersion of soils for mechanical analysis. Soil Sci. Soc. Amer. Proc. (1939) 4: 106-113. 1940.*

[3] *Wilde, S. A., and Voigt, G. K. Analysis of soils and plants for foresters and horticulturists. Ed. 2, 117 pp., illus. 1959. Ann Arbor, Mich.*

[4] *Kilmer, V. J., and Alexander, T. T. Methods of mechanical analysis of soils. Soil Sci. 68: 15-25. 1949.*

[5] *Walkley, A., and Black, I. A. Rapid filtration method of soil organic matter determination. Soil Sci. 37: 29-38. 1934.*

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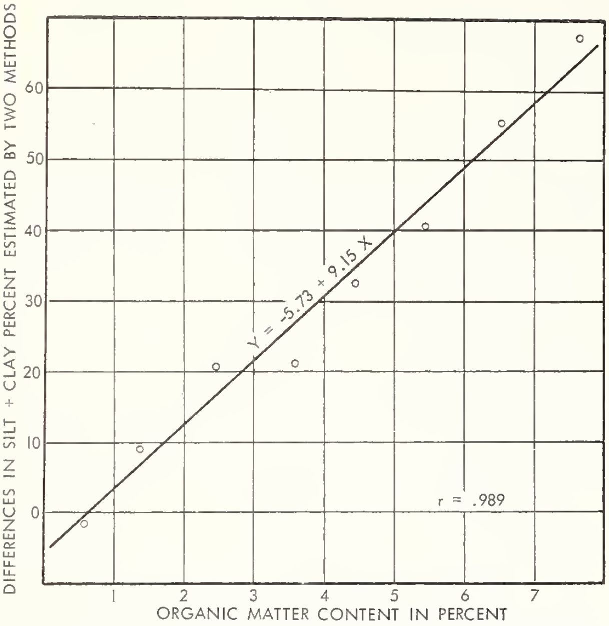

Figure 1. — Relationship of organic matter content to differences in silt-plus-clay determinations by two methods of analysis.

content as determined by the two methods are estimated well by a linear function of organic matter, Y = —5.73 + 9.15 X.

The effect of an increase in organic matter content on the accuracy of the hydrometer method is shown in table 1 where the data for all plots were averaged for each sampling depth. In the 0-6 and 6-36 inch sampling levels, differences of 34 and 8 percent respectively were obtained in silt-plus-clay determinations by the two methods. In the 36-72 inch sampling depth the difference was less than 1 percent.

The North Dakota Chernozem soils studied illustrate the pronounced effect that the level of organic matter can have on the accuracy of field analysis. On the other hand, forest soils are generally low in organic matter. However, in some situations, the level of organic matter could contribute to erroneous conclusions.

Table 1. — *Mean differences in silt-plus-clay determinations by two methods of analysis as related to depth of sampling*

Sampling depth (inches)	Organic matter content	Silt-plus-clay content		
		Pipette	Hydrometer	Differences
	Percent	*Percent*	*Percent*	*Percent*
0-6	4.59	50.62	16.70	33.92
6-36	1.37	51.43	43.37	8.06
36-72	0.51	51.46	50.87	0.59

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ALBERT G. CLEGG
Research Forester

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